

April 2, 1946.

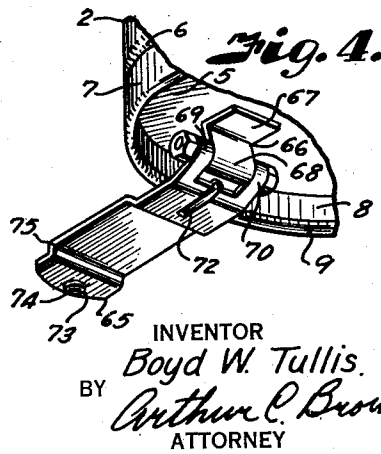
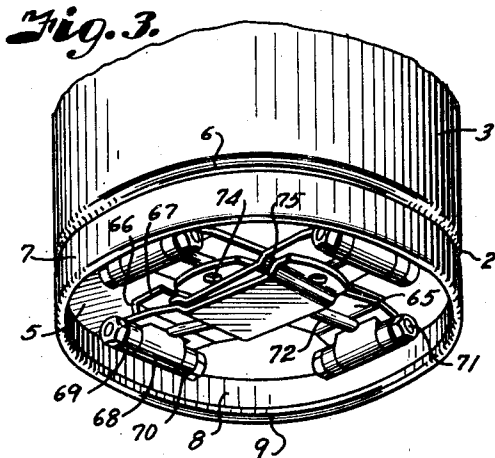
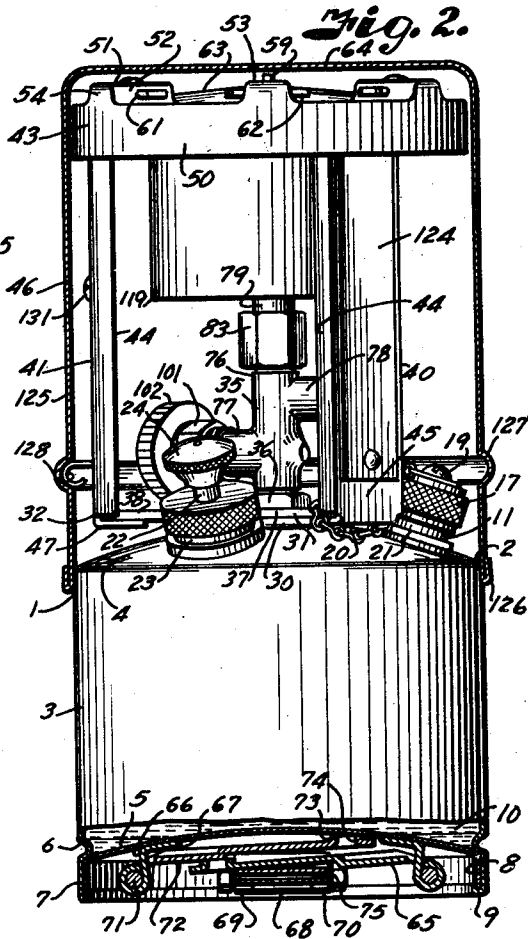
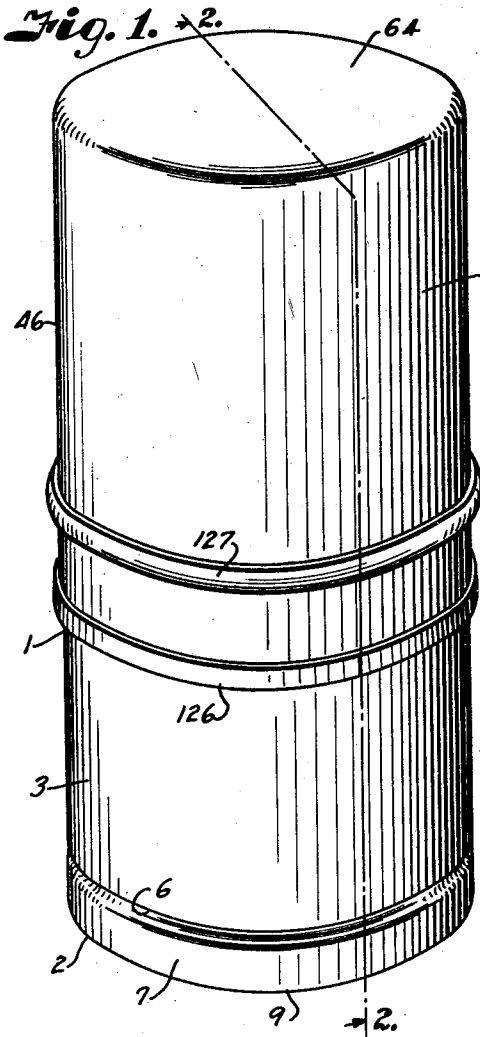
B. W. TULLIS

2,397,766

PORTABLE STOVE

Filed Jan. 12, 1942

3 Sheets-Sheet 1



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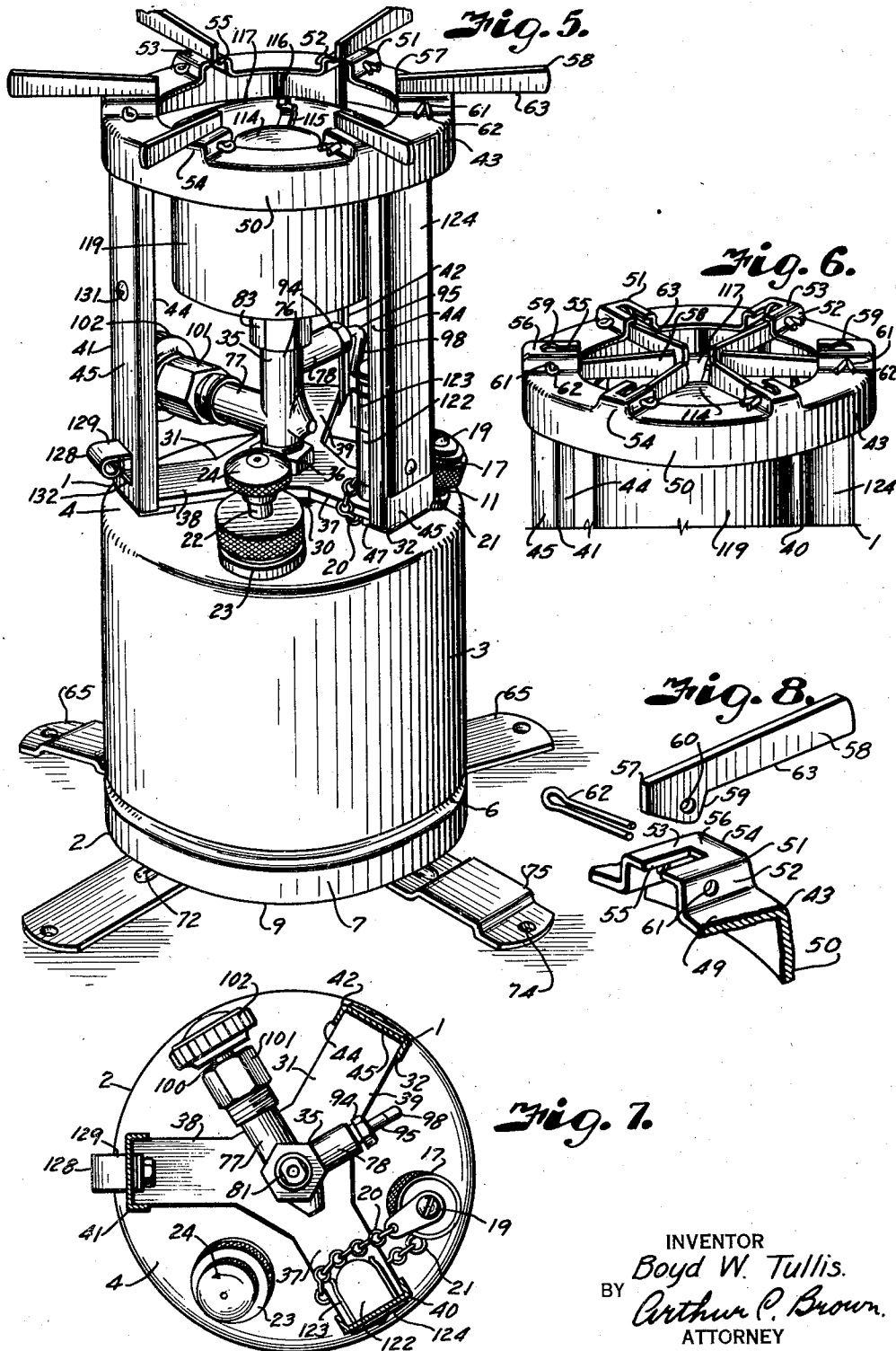
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3 Sheets-Sheet 2



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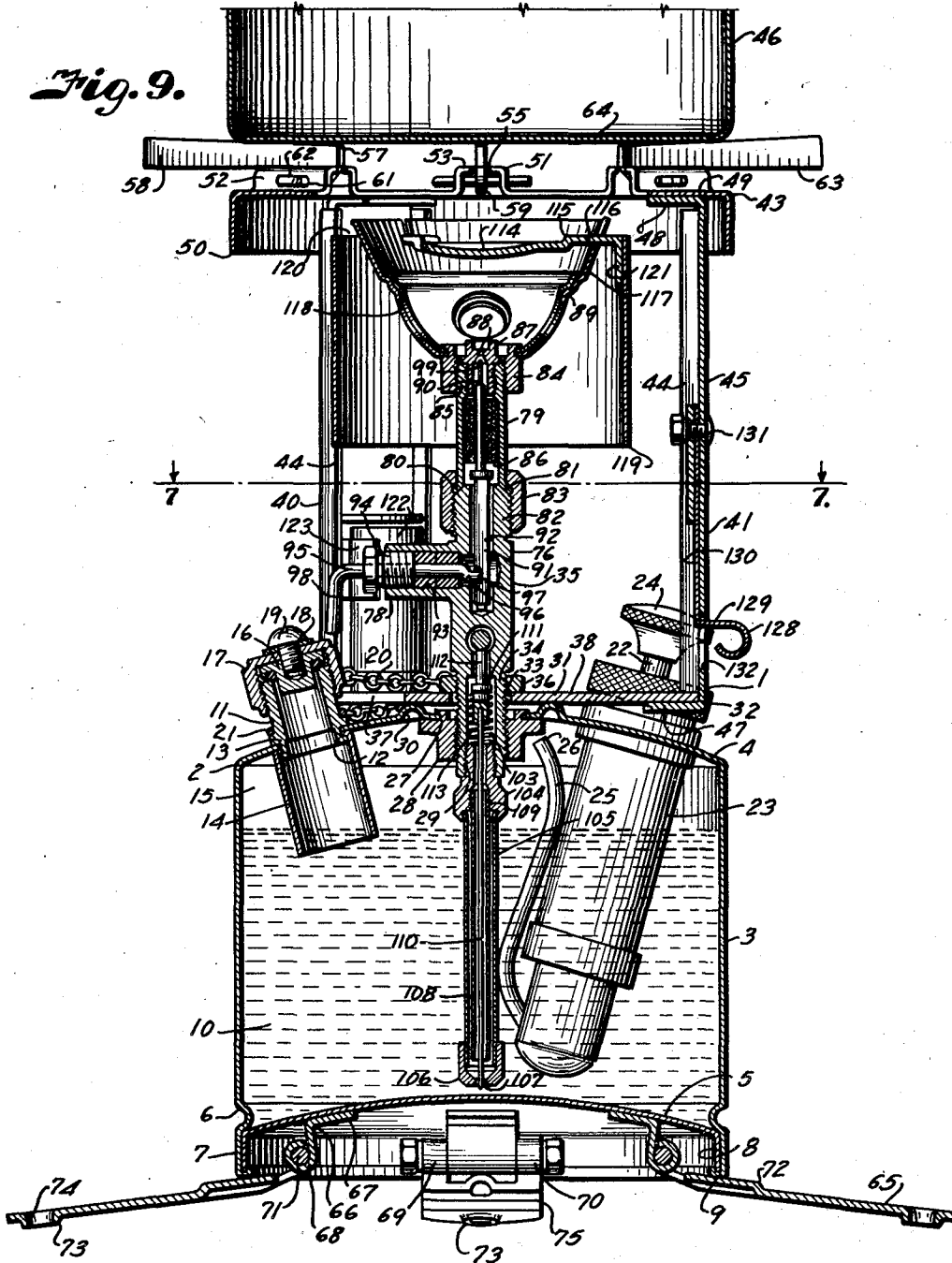
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,397,766

PORTABLE STOVE

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Application January 12, 1942, Serial No. 426,421

9 Claims. (Cl. 126-38)

This invention relates to stoves for cooking and/or heating purposes using various types of liquid fuels including those containing tetraethyl lead compounds and of a type characterized by their ease of transportation so that they are adaptable to general utility use and particularly for supplying camping, sports, military, exploration, and similar needs.

The principal objects of the invention are to provide a stove of this character of compact, light weight construction, and which is capable of being operated under all climatic conditions.

Another object of the invention is to provide a stove having a stable support and a substantially standard cooking grid, foldable within relatively small dimensions to form a compact package so that it may occupy a very limited space.

Further objects of the invention are to provide for permanent attachment of the foldable parts to avoid loss thereof and facilitate the setting up and knocking down operations; to provide a stove structure that is readily manipulated in cold climates where unprotected hands cannot be employed in handling the parts; to provide the stove with a fuel container that is adequately capped and valved so that the fuel cannot escape therefrom when the stove is being transported; to provide the stove with a container for essential repair parts; and to provide the stove with a casing which cooperates with the fuel tank in protecting the operating parts when the stove is not in use and which casing may be used as a cooking vessel when the stove is in use.

It is a further object of the invention to provide a stove structure adapted for use in first aid kits, especially those containing instruments requiring sterilization.

In accomplishing these and other objects of the invention, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the stove when packed ready for transportation.

Fig. 2 is a vertical central section on the line 2-2 of Fig. 1.

Fig. 3 is a perspective view of the base of the stove showing the supporting legs folded thereunder.

Fig. 4 is a fragmentary view of the base portion of the stove showing one of the legs in projected position.

Fig. 5 is a perspective view of the stove ready for use.

Fig. 6 is a perspective view of the upper por-

tion of the stove showing the grid fingers in folded-in position.

Fig. 7 is a horizontal section on the line 7-7 of Fig. 9.

Fig. 8 is a fragmentary perspective view of the grid ring showing one of the grid fingers in disassembled spaced relation.

Fig. 9 is an enlarged vertical section through the stove as it appears when being used.

Referring more in detail to the drawings:

1 designates a stove constructed in accordance with the present invention including a tank 2 which, in the illustrated form, has a cylindrical side wall 3, an upwardly crowned top 4 and an inset bottom 5, also crowned in the direction of the top 4 and having support against an inwardly turned bead 6 formed circumferentially of the side wall and spaced upwardly from the lower edge a sufficient distance to form a base flange 7. The bottom 5 has an annular flange 8 engaged within the flange 7 and sealed therewith by turning the lower edge of the flange 7 upwardly over the inner face of the flange 8 as shown at 9, Figs. 2 and 9. The joint 9 may be soldered or otherwise sealed to enhance the rigidity of the base flange and prevent leakage of fuel 10 from the tank.

The top of the tank is provided with a filler neck 11, having a flange 12 projecting through an opening 13 in the top 4 and which carries a depending tube-like skirt 14 that extends into the fuel compartment for limiting the filling thereof so as to maintain at all times an air space 15 above the fuel level. The fill neck is closed by a gasket disk-like plug 16 carried by a cap 17 threaded onto the fill neck. The cap has an opening 18 to pass a screw spindle on the disk so that the cap may be turned upon the filler neck without rotating the disk. The cap 17 is of the captive type, being provided with a chain 20, having one end secured to the screw 19 and the other end attached to a ring clip 21 encircling the fill neck. The chain is of sufficient length to permit ready removal and application of the cap when filling the tank with fuel.

Also carried by the top 4 and projecting angularly into the tank so as to provide clearance for actuation of the plunger rod 22 thereof is a pump cylinder 23 in which is slidably mounted a piston (not shown) adapted to be manipulated by the rod 22. The rod 22 has a knob 24 by which the rod is reciprocated to pump up air pressure within the tank when the thumb closes an opening in the knob 24. Connected with the outlet end of the cylinder is a tube 25 having

an outlet 26 emptying into the air space 15, as clearly shown in Fig. 9. The outlet of the pump is provided, as in customary practice, with a valve (not shown) which is manipulated by turning of the knob 24 in a clockwise direction when the plunger is in its innermost position so as to prevent leakage of fuel by way of the pump when the stove is moved to a reclined or upside down position.

The top of the tank is provided in the center thereof with an opening 27 carrying a bushing 28 having a threaded bore 29. Formed in the top of the tank, circumferentially of the bushing, is an upwardly projecting bead 30 forming a reinforcement and seat for a spider-like bracket 31 constituting the lower portion of a grid supporting frame 32.

The tank above described may be made in any desired capacity, but in the particular stove illustrated is approximately four inches in diameter and the cylindrical wall thereof is free of projections to form the lower portion of the package when the stove is "knocked down" and ready for transport.

The spider-like bracket has a central opening 33 registering with the bore of the bushing 28 to pass an exteriorly threaded tubular leg 34 of a valve body and burner support 35, which leg is threaded into the bore of the bushing and carries a lock nut 36 engaging the upper face of the spider-like bracket 31 to retain it in clamped engagement with the seating bead 30 whereby the spider is rigidly retained in a horizontal plane with respect to the vertical axis of the stove since it constitutes the sole support for the frame 32 and the cooking vessel placed on the grid thereof. The spider-like bracket includes radially extending arms 37, 38 and 39, terminating slightly short of the extended plane of the side wall of the tank and located so that the arm 37 projects through the space between the fill neck 11 and the pump as shown in Fig. 5.

Connected with the terminal ends of the arms are posts 40, 41 and 42 respectively supporting a grid ring on their upper ends. The posts are preferably formed of channel material and arranged with the flanges 44 thereof extending inwardly with the web portions 45 facing outwardly to provide smooth exterior faces slightly within the boundary of the tank to provide clearance for the cap-like casing 46, later described. The lower ends of the web portions of the channels have inwardly turned flanges 47 that extend under the arms of the spider-like bracket and are rigidly attached thereto, preferably by spot welding or equivalent fastening means. The upper ends of the channels have similar flanges 48 attached as by spot welding to an inwardly extending annular flange 49 of the ring 43, best shown in Fig. 9. The ring 43 further includes a depending annular flange 50 extending circumferentially of the posts and substantially registering with the extended plane of the side wall of the tank to cooperate therewith in supporting the cap-like casing 46, later described.

Formed in the inwardly extending flange 47 are a plurality of spaced bosses 51 shaped to have spaced sides 52 connected in rounding curves by webs 53, the outer end faces of the bosses being closed, as at 54, so that they are extremely rigid and enhance the rigidity of the grid ring 43, particularly the inwardly extending flange 49 thereof.

Formed in the web portions of the respective bosses is a slot 55 opening from the inner edge

thereof and terminating short of the closed outer ends to form seat-like surfaces 56 for a purpose later described. Mounted within each of the slots is a grid finger 57, best illustrated in Fig. 8. Each grid finger includes a relatively thin, bar-like portion 58 having a wing portion 59 projecting from the edge thereof near its inner end to project through the slots 55. The wings are provided with openings 60 registering with similar openings 61 in the side portions 52 of the bosses for passing cotter pins or the like 62 whereon the fingers are adapted to pivot from an outwardly extending grid-forming position above the ring 43 to a folded position entirely within the bounds of the ring so that they are encompassed thereby when folded, as shown in Fig. 6. When in extended position the fingers 58 are supported upon the bosses so that the edges 63 thereof bear upon the seat-like surfaces 56 and the free ends of the fingers cantilever thereover to form a grid of adequate size to support the usual cooking utensils such as a frying pan, coffee pot, or the member 46 previously referred to which may also be used as a cooking vessel. When the fingers are in folded position they are swung inwardly toward the center of the ring, in which position they lie below the level of the bosses so that when the member 46 is inverted thereover the end 64 of the member 46 seats over the bosses and keeps the fingers in closed position. When the fingers are extended they raise the vessel a sufficient distance above the grid ring 43 so that flame of the burner (later described) plays over the ring to cover a substantial area on the bottom of the vessel.

Owing to the fact that the base of the stove is of relatively small diameter it is not sufficiently stable to prevent tipping of the stove, particularly when it is supported on snow, sand, or the like. In order to overcome this difficulty the base of the stove therefore is provided with legs 65, each including a plate-like member having a width and length to provide sufficient bearing to support the stove on soft surfaces, but the legs are short enough so that they may be folded within the space formed within space encircled by the base flange 7. The legs are hinged to brackets 66, having flange portions 67 attached to the under face of the bottom 5 by spot welding or the like. The brackets also include depending portions 68 having the ends curled retractively to engage between similarly curled portions 69 and 70 on the inner ends of the legs which form hinge elements through which hinge pins 71 project. In order to enhance rigidity of the legs, the portions thereof engaging the rim of the base flange are preferably provided with stiffening ribs 72. It is also desirable that the legs be provided with claw portions 73 to prevent sliding thereof. In the illustrated instance, these portions are shown as formed by depressing the metal circumferentially of openings 74 through which fastening devices may be extended if it is desired to anchor the stove to a base. In order that the leg portions may all fold one over the other within the bounds of the base flange and permit setting of the tank flatly upon a support, selected legs are provided with offsets 75 to accommodate the adjacent legs when they are folded across each other as shown in Fig. 3. The legs thus described form a support for the stove, having sufficient extent to prevent tipping thereof when the grid fingers are supporting a cooking vessel of relatively large diameter.

The burner portion of the stove constitutes the

subject matter of a separate application filed of even date and bearing Serial No. 426,420. However, the burner portion is briefly described as the form thereof lends to the compactness of the stove structure. The valve body 35 previously referred to has an axial, upwardly extending branch 76, a lateral branch 77 extending through the space between the posts 41 and 42 and a branch 78 projecting into the space between the post 42 and the filler neck. Supported on the upper end of the axial branch 76 is a sleeve-like vaporizer tube 79, having a bell-shaped flange 80 on its lower end engaging a bevelled seat 81 on a threaded neck 82 of the branch 76 and which is retained by a union nut 83 swivelly supported on the generator body and having a threaded portion engaging the threads of the neck as best shown in Fig. 9. The upper end of the vaporizer is provided with exterior threads 84 and the wall portion 85 thereof is relatively thick to provide sufficient metal to conduct the amount of heat to the vaporizing chamber 86 within the tube necessary to vaporize the lower boiling point fractions of the fuel. The vaporizer is provided with a jet nozzle 87 that is threaded into its upper end and has a relatively fine orifice 88 through which atomized fuel and vapor are discharged into the bowl of the burner 89 which is screwed upon the wall portion 85 of the vaporizer.

Since the orifice is relatively small and likely to become clogged, a clean-out needle 90 is provided which includes a guide portion 91 reciprocally supported in a vertical bore 92 in the valve body and which connects with the bore 93 in the lateral branch 78. The bore of the lateral branch is closed by a packing nut 94, in which is rotatably supported a rock shaft 95 having a crank 96 on its inner end engaging a transverse notch 97 in the guide portion of the clean-out needle, as shown in Fig. 9. The outer end of the rock shaft is bent laterally to provide a handle 98 by which it may be oscillated to move the point 99 of the needle through the orifice 88 to clear the orifice of dust, carbon, or other accumulation. The other lateral branch 77 contains a valve stem 100 to control flow of fuel from the tank into the bore 92 for discharge into the vaporizer. The valve stem projects through a packing nut 101 threaded onto the branch 77 and which carries a hand-wheel 102. The threaded leg of the valve body has an axial recess 103 opening downwardly into the tank and having connection with the valve port through which fuel flows into the vaporizer.

Threaded into the bore of the leg portion is a fitting 104 carrying a depending tube 105 having a cap 106 on the lower end thereof located in close proximity to the bottom 5 of the tank. The cap 106 is provided with a fuel inlet orifice 107 through which fuel is passed into an inner tube 108 extending downwardly through the tube 105 and threadedly supported at its upper end in a bore 109 of the fitting 104. Reciprocable in the inner tube, and having one end adapted to project through the orifice 107, is a fuel throttling rod 110. The upper end of the rod carries a head 111 reciprocable in the recess 103 and which has an upwardly extending stem 112 adapted to engage a cam surface (not shown) on the valve stem so that when the valve is closed the lower end of the rod extends through the orifice to throttle flow of fuel therethrough, but when the valve is completely open a spring 113 in the recess lifts the rod to remove the lower

end thereof from throttling relation with the inlet orifice, the spring 113 being mounted in the recess so that one end engages the fitting and the other end a flange on the head of the throttling rod, as shown in Fig. 9.

Owing to the fact that various fuels will be used in the stove, and particularly those containing gums, coloring matter and tetraethyl lead, high boiling point fractions containing the gums and the tetraethyl lead are discharged from the vaporizer as atomized liquids directly onto the burner bowl so that they impinge against a spreader plate 114 that is carried by radially extending arms 115 supported in notches 116 formed in the outwardly flaring flange 117 of the burner bowl. The lower portion of the burner bowl is provided with air inlets 118 for the admission of primary air which mixes with the fuel discharged from the jet nozzle 87. In order to control the inlet of secondary air circumferentially of the burner bowl, the upper portion of the vaporizer tube and burner bowl are enclosed by a sleeve-like shield 119 of larger diameter than the rim of the burner bowl to provide an air passageway 120 therearound. The shield is supported in fixed position relative to the burner by attachment thereof to downturned flanges 121 provided on the ends of the arms 115.

After substantial use the vaporizer tube may become clogged and to have another one convenient, I have provided the stove with a container in the form of a sleeve 122 that is retained in a clip 123 projecting from the inner face of the post 40 as shown in Figs. 5 and 9 to contain a spare vaporizer.

Instructions for operating the stove may be provided on tags 124 which are attached to the outer faces of the posts, as shown in Figs. 2 and 5.

The cylindrical wall 125 of the casing is of suitable inner diameter and of a length so that when a top of the casing engages over the inwardly folded grid fingers the rim 126 of the side wall overlaps the upper portion of the tank a sufficient distance to provide a dust-tight joint. The side 125 of the casing is provided with an outwardly formed, circumferential corrugation 127 to be engaged by the head 128 of a spring latch 129. The latch 129 is carried between the side flanges of one of the posts and the leaf 130 thereof is secured to the web by a fastening device 131. The lower end of the spring carrying the head 128 extends downwardly along the inner face of the post and the head projects through an opening 132 that is formed in the post as shown in Fig. 5. The projecting portion of the head is preferably curled retractively so that it fits snugly within the corrugation as shown in Fig. 2.

Assuming that the stove is assembled as described and received by the user in the form shown in Figs. 1 and 2, the casing 46 is removed by withdrawing it from over the top of the grid, the latch head 128 riding from engagement with the corrugation 127 when a pulling pressure is applied. The grid fingers 57 are then swung to projected position. This may be readily effected by inverting the stove so that all the fingers fall outwardly and when righted they drop to the position shown in Fig. 5, or the fingers 57 may be moved separately from packed position to grid-forming position. The legs 65 of the stove are then moved from their packed position within the base flange 7 of the tank and swung outwardly to the position shown in Fig. 9. The fill cap 17 is then removed and the tank filled with fuel

up to the bottom of the tube 14. Position of the valve 100 is then noted and if open, the valve is closed, which operation moves the throttle rod 110 through the inlet orifice 107. The outlet valve of the pump is then opened by rotating the knob 24 in the direction of the arrow, whereupon the pump plunger is reciprocated to pump the air pressure in the space 15 provided in the upper portion of the tank 2. The clean-out needle 90 may then be operated by rocking the lever arm 98 to assure that the orifice 88 is clear of obstruction. The valve 100 is then opened slightly so that the air pressure in the tank causes displacement of the fluid through the throttled orifice 88 at sufficient velocity to effect atomization thereof when it is discharged through the vaporizer and orifice 88 into the burner bowl 89. The atomized fuel is then lighted and the flame plays against the spreader plate 114 and is directed outwardly against the flaring flange 117 of the burner bowl so that it is heated. Heat of the flange 117 is conducted downwardly through the bowl 89 and through the thickened wall portion 85 of the vaporizer tube so that the vaporizer is heated sufficiently to begin vaporization of lower boiling point fractions of the fuel, whereupon a part of the fuel is discharged into the burner in gaseous form to promote ignition of the atomized components of the fuel. Upon further opening of the fuel control valve the throttling rod 110 is removed from the inlet orifice 107 so as to permit full flow of fuel from the tank into the burner to continue operation of the stove. A vessel or the casing 46 may be applied on the grill so that the flame plays against the bottom thereof.

When it is desired to pack the stove, the fuel valve is closed and the pump knob 24 is rotated to close the outlet valve thereof so as to assure against leakage of fuel from the tank. The grid fingers 57 are then moved from projecting position to their position within the grid ring 43 to seat upon the rim of the burner bowl. The legs 65 of the stove are then swung to their position within the recess formed by the base flange 7 and inset bottom 5 as shown in Fig. 3. The casing 46 may then be inverted over the grid and burner portion of the stove so that the rim 126 passes over the upper portion of the fuel tank, whereupon the latch head 128 rides into the corrugation of the annular groove 127 to retain the casing frictionally in position as shown in Fig. 2.

From the foregoing it is obvious that I have provided a stove structure characterized by its compactness, lightness in weight, and the limited space required to store it. However, when the stove is unfolded and set up for use, it has a relatively large grid capable of supporting ordinary sized vessels and the legs when extended provide adequate support to maintain stability of the stove on any supporting surface. Since all the foldable parts are permanently attached, they will not become lost and the time required for setting up and knocking down the stove is reduced. This is an important feature of the appliance when it is to be used in cold climates and exposed places or temporary shelters where unprotected hands cannot be employed to handle the metal parts, that is, the parts may be manipulated while the operator is wearing gloves or mittens. It is also obvious that the stove is adapted for general utility purposes and particularly by sportsmen, campers, autoists, and soldiers, since it is of light, compact construction and readily transported.

The stove as constructed is adaptable for use

in first aid kits, particularly those containing instruments and materials requiring sterilization.

The fuel is positively confined when the stove is not in use so that it cannot leak therefrom during transportation. Consequently, the stove may be kept filled with fuel so that it is at all times ready for instant use in any emergency.

What I claim and desire to secure by Letters Patent is:

1. A stove including a cylindrical tank having a rim-like base portion forming a recess under the tank, brackets in said recess, and legs hinged to said brackets and adapted to be moved from said recess to a position projecting radially from the tank, said legs having portions to seat the rim-like base thereon when the legs are in projecting position.

2. In a stove including a burner, a vessel supporting grid including a ring encircling the burner and having a flange portion extending inwardly toward the burner and provided with a plurality of upwardly projecting slotted bosses, a plurality of fingers arranged in substantially radial relation and having ends projecting inwardly toward the center of the burner for support on the burner in one position, wing-like portions positioned in the slots of the bosses and projecting from upper edges of said fingers when the fingers are supported on the burner, and pins extending through the wings and said bosses to pivotally carry the fingers below said bosses when the fingers are supported on the burner, said fingers being adapted to swing outwardly to a position above said bosses to project from said ring.

3. A stove including a tank having a base rim and a recessed bottom forming a compartment, a burner assembly supported above the tank, and legs pivotally connected with the recessed bottom of the tank and adapted to be movable from said compartment to a position with outer ends of said legs projecting radially of said tank to support said tank and burner from overturning, said legs having a length relatively to width of the tank to overlap each other at the center of the compartment when the legs are positioned in said compartment.

4. In a stove including a burner, a vessel supporting grid including a ring encircling the burner and having a flange portion spaced from the burner to provide a flame space therebetween, said flange having a plurality of upwardly projecting slotted bosses and having finger seats registering with said slots at the outer portion of said ring, a plurality of fingers arranged in substantially radial relation and having ends projecting inwardly over the burner toward the center of said burner in one position, wing-like portions positioned in said slots of the bosses and projecting from upper edges of said fingers when the fingers are in said above mentioned position, and pins extending through the wings and said bosses to pivotally carry the fingers below said bosses when the fingers are supported over the burner, said fingers being adapted to be pivoted outwardly to a position above said bosses with the fingers engaging said seats.

5. A portable stove including a cylindrical fuel supply tank, a pump and a filler neck in the top of the tank offset outwardly from the axial center of the tank, a vaporizing tube having a fuel outlet orifice, a cleanout needle projectable through the orifice, a fuel control valve supported by the top of the tank substantially on the axial center of the tank and having an operating means for con-

trolling flow of fuel from the tank, a plurality of posts, means carrying the posts substantially in alignment with the cylindrical wall of the tank, said posts being spaced apart to provide individual operating spaces therebetween for permitting manual operation of the fuel control valve operating means, the filling neck and said pump, said cleanout needle operating means being in the space accommodating the filler neck and located in spaced relation to the filler neck.

6. A stove including a tank, a spider-like member supported on the tank and having radial arms, posts fixed to ends of the arms, a grid ring having a diameter substantially conforming to the diameter of the tank and carried by the upper ends of the posts, said ring having inner and outer portions, a burner supported axially of the spider and encircled by said ring below the level of said inner portion, a plurality of grid fingers having wings projecting from one end of said fingers, and pivotal means connecting said wings with the inner portion of said ring for movement of the other ends of the fingers from support on the burner below said inner portion of the grid ring to a position projecting outwardly and radially above said inner portion and with the fingers resting on said outer portion.

7. A stove including a burner, a vessel-supporting grid including a ring, means supporting said ring encircling the burner and spaced therefrom to provide an air passageway therebetween, a plurality of fingers having wings extending from one end thereof, and means pivotally connecting the wings with said ring for movement of the free ends of the fingers from a position extending radially outwardly above said ring to a position below said ring with said free ends of the fingers extending over the burner.

8. A stove of the character described including, a tank, a spider having support on the tank and

provided with arms terminating within the extended planes of the side wall of the tank, posts carried on outer ends of the arms within said planes, a burner bowl, means supporting the burner bowl coaxially of the spider, a grid ring carried on the posts above the burner bowl encircling the upper portion of the burner bowl and located in substantial registry with said extended planes, grid fingers, means pivotally supporting the grid fingers on the grid ring for transport from a position with ends of the grid fingers projecting radially outward from said grid ring to a position radially inward of the grid ring and over the burner bowl, a casing-like cover adapted to be inverted over said grid ring when the grid fingers are positioned over the burner bowl, and having a rim portion engaging the side wall of said tank.

9. A stove of the character described including a tank, a spider having support on the tank and provided with arms terminating within the extended planes of the side wall of the tank, posts carried on outer ends of the arms within said planes, a burner bowl, means supporting the burner bowl coaxially of the spider, a grid ring carried on the posts above the burner bowl and located in substantial registry with said extended planes, grid fingers, means pivotally supporting the grid fingers on the grid ring for transport from a position with ends of the grid fingers projecting radially beyond the grid ring to a position in which said ends project radially inwardly over the burner bowl, a fill neck and an air pump supported by the tank intermediate selected arms of the spider, and a valve supplying fuel to the burner having an operating means located in the space between other arms of said spider and terminating within said extended planes.

BOYD W. TULLIS.